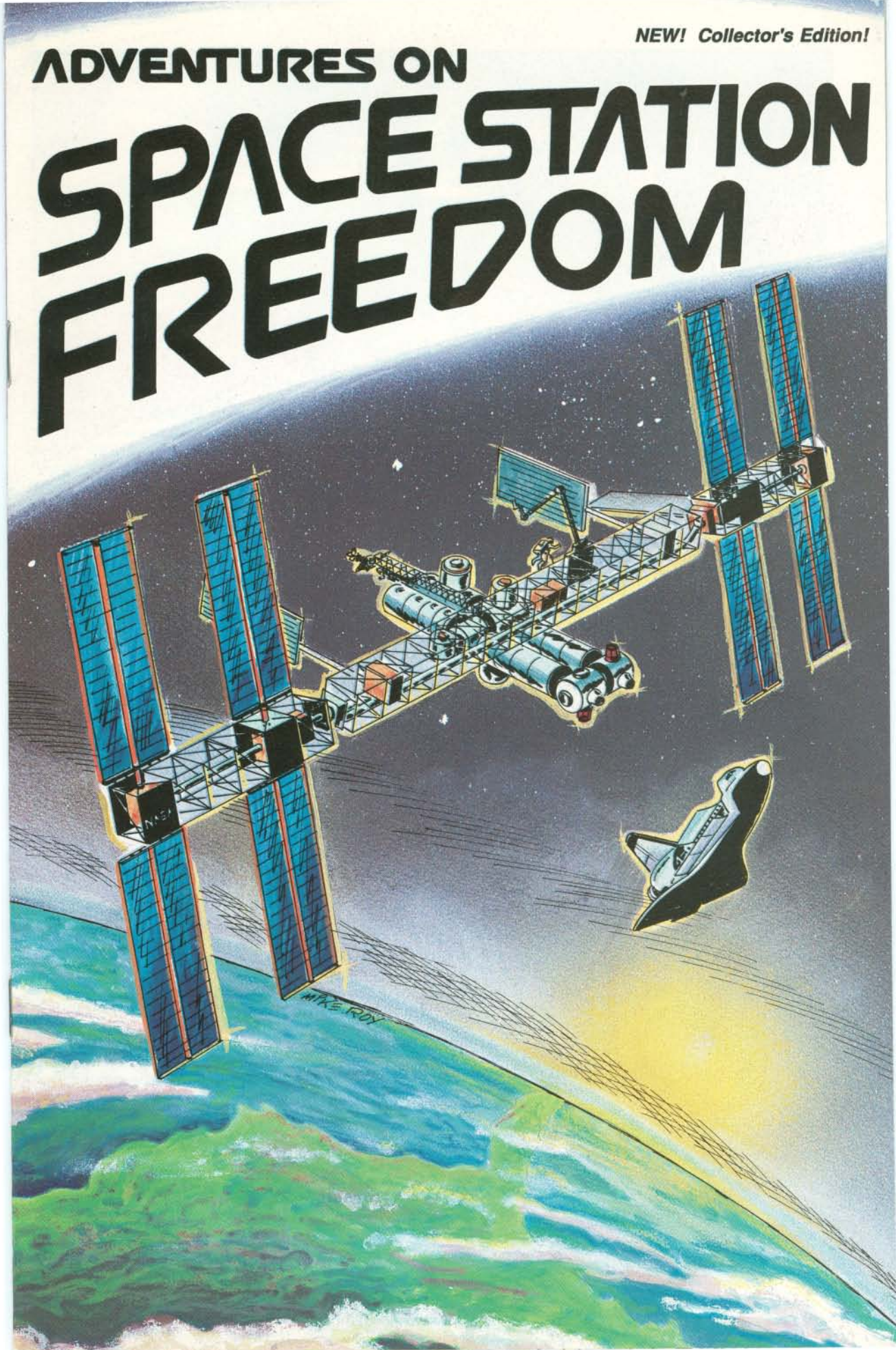
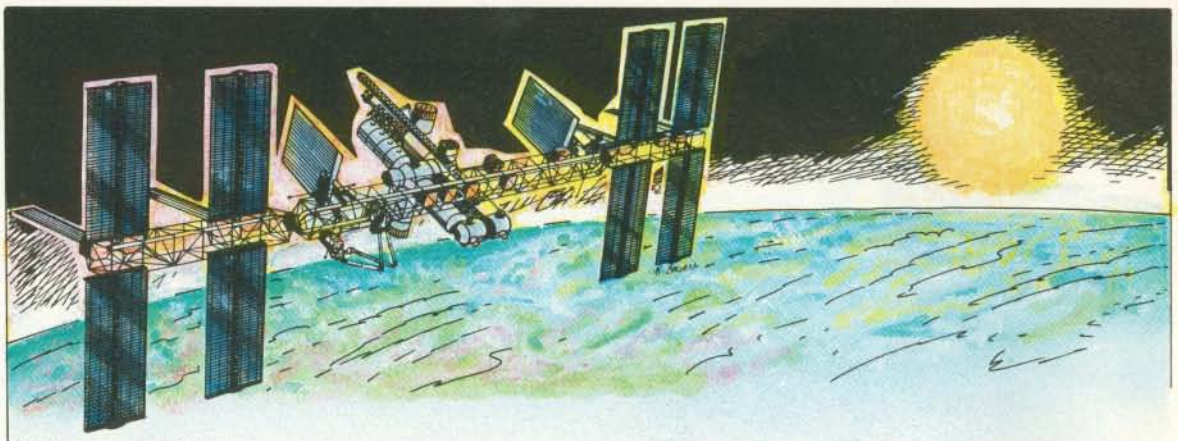
NEW! Collector's Edition!

ADVENTURES ON SPACE STATION FREEDOM





Hi Boys and Girls,

Well, a new age in Space is about to begin -- the age of the Space Station. President Reagan named it "Freedom." While you're in school, Space Station Freedom will be built and while you're in college, it will be launched and assembled in orbit about 250 miles above the Earth. It will stay up there for thirty years or more -- a whole generation! It will be a laboratory, school and home in space for both American and international astronauts and scientists. Just like your mom or dad goes to work, people will go back and forth to Space Station Freedom to learn about space and the secrets it holds.

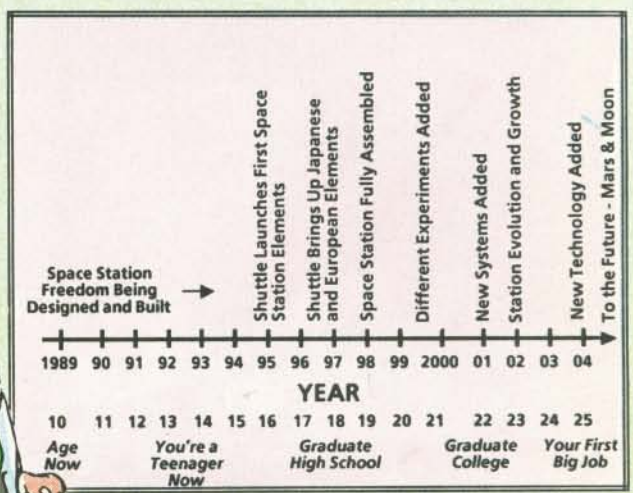
You might be one of the lucky ones who works in space or helps to work on the Space Station from Earth. But you'll have to be prepared and chosen from a group of very well trained and educated people. These people are kids now, too! This new series of comic books, "The Adventures on Space Station Freedom," will help you get ready for your career in space. It will teach you about space science, about working there, and about living there. Reading it will be fun, too!

Please write me if you have any questions about space or have ideas for what you might want covered in our next comic book. I will try to answer them personally or in future issues of the comic books. You might even recognize your question being answered in the next issue.

"Spaceally" yours,

Uncle Dutch

Uncle Dutch
TADCORPS
600 Maryland Ave. S.W.
Suite 200 East
Washington, D.C. 20024



ADVENTURES ON SPACE STATION FREEDOM

Created by **Manfred "Dutch" von Ehrenfried** of TADCORPS, 600 Maryland Avenue, S.W., Suite 200 East, Washington, D.C. 20024. Produced by **Custom Comic Services,** Educational and Promotional Comic Books, P.O. Box 50028, Austin, TX 78763. Artwork by Mike Roy.
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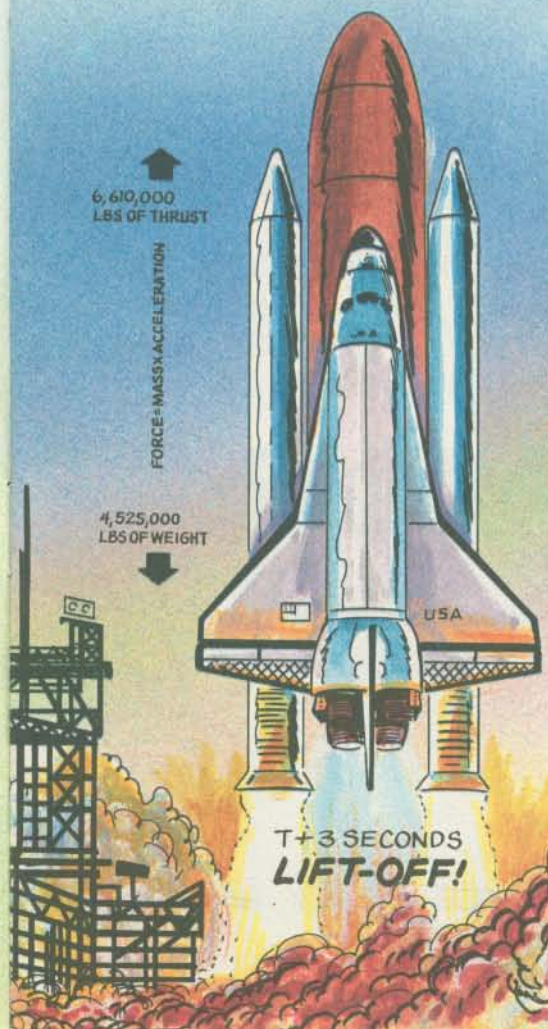
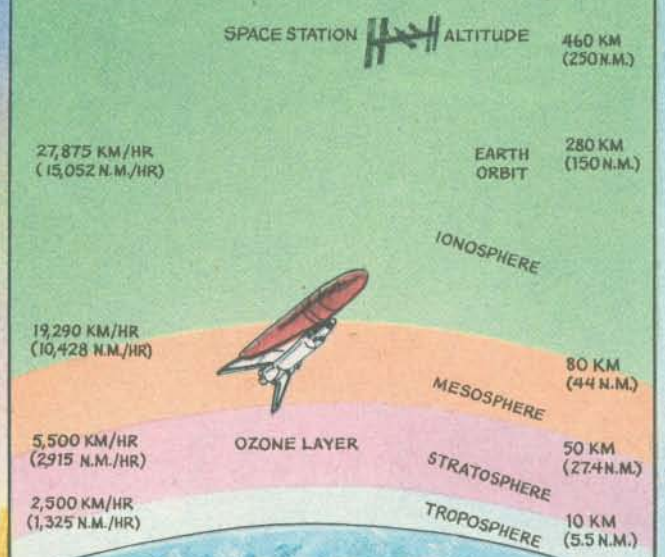
FOUR YOUNG STUDENTS, ALL INTERNATIONAL SCIENCE FAIR WINNERS, ON BOARD THE SPACE SHUTTLE DISCOVERY AWAIT THEIR GREATEST ADVENTURE!

T-MINUS 5-4-3··

A+T-3 SECONDS, MAIN ENGINE IGNITION!



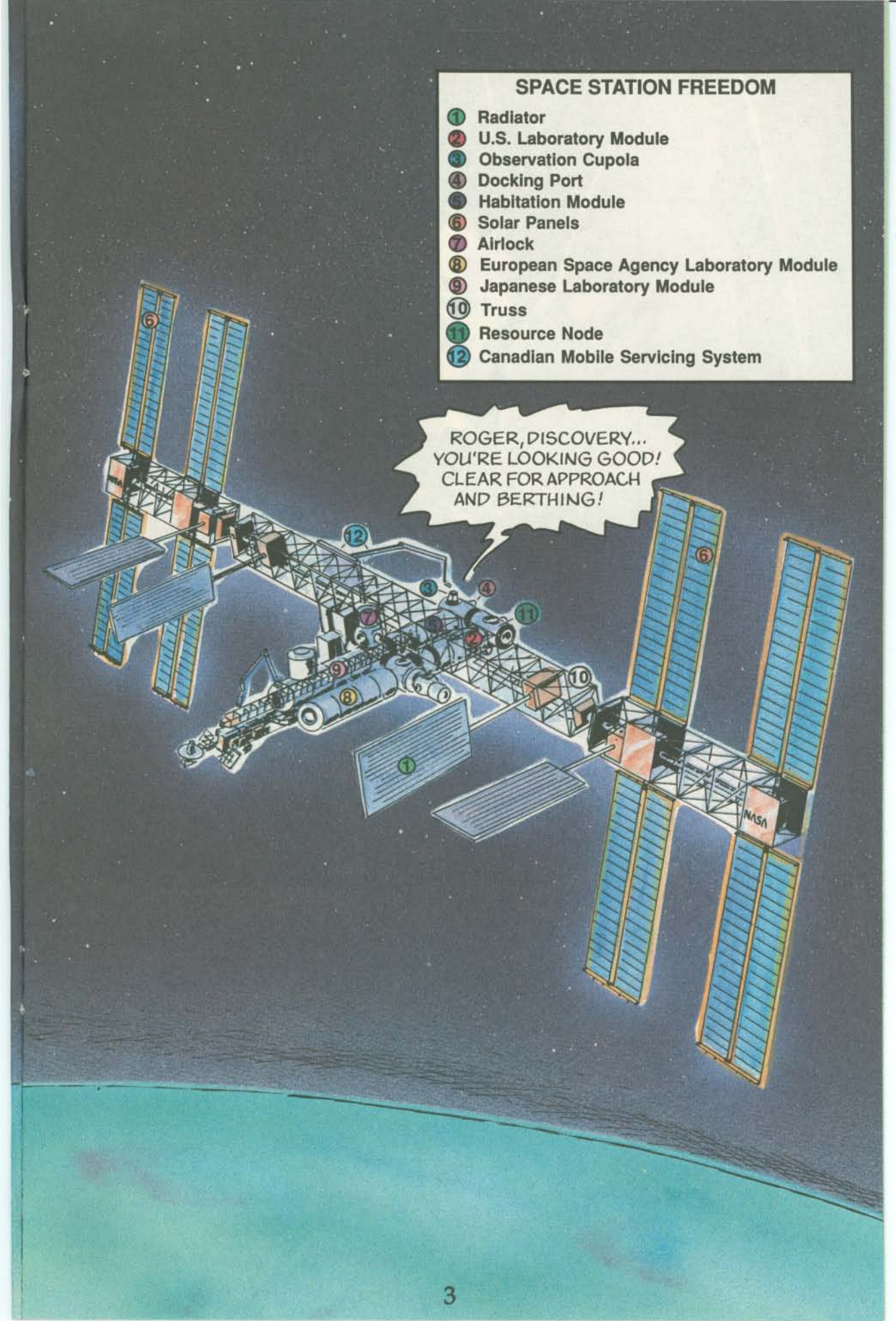
THE SHUTTLE FIGHTS THE EARTH'S GRAVITY, CLIMBING TO THE UPPER LAYERS OF THE **ATMOSPHERE.**

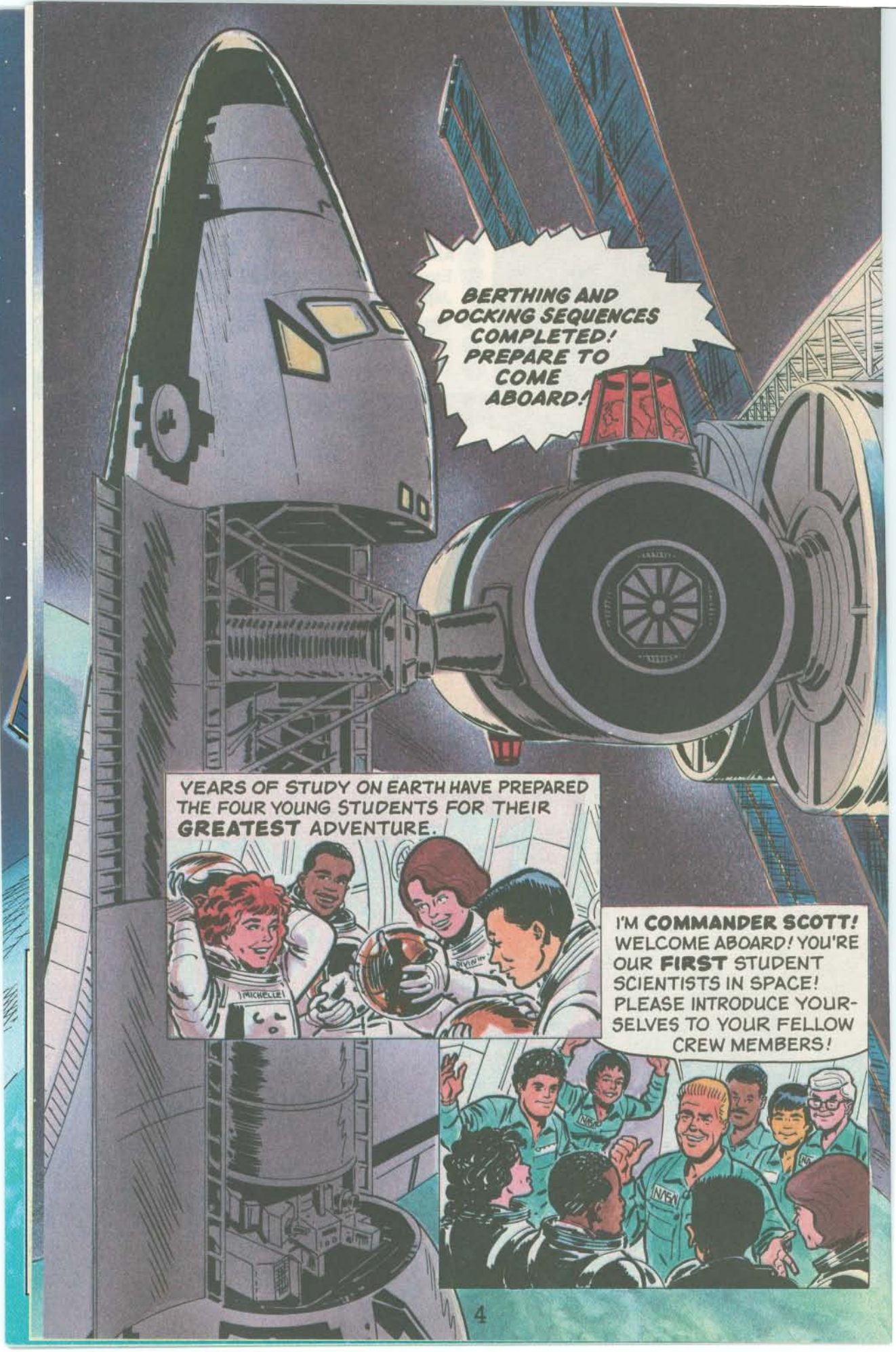


AT 150 MILES AND 15,052 NAUTICAL MILES PER HOUR IT GOES INTO LOW EARTH ORBIT, AND THEN CLIMBS TO THE SPACE STATION'S ALTITUDE.

SPACE STATION FREEDOM

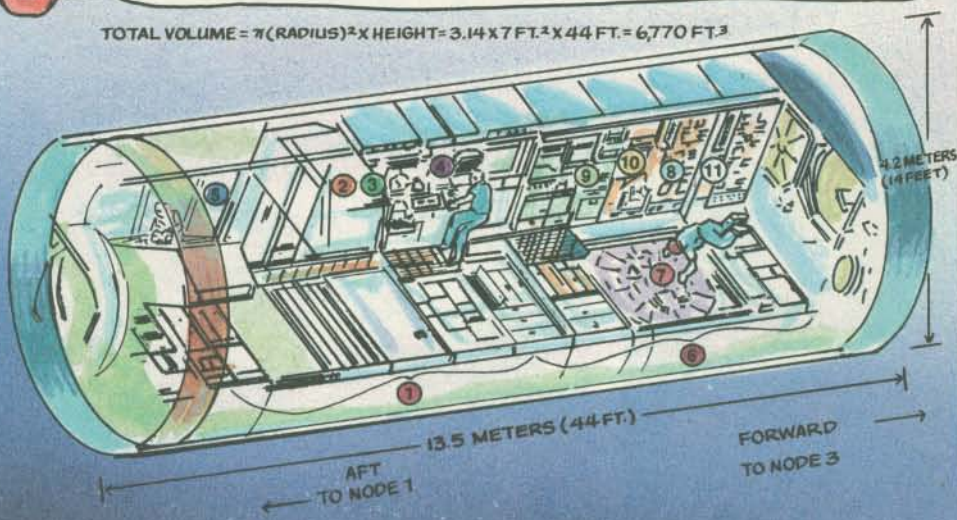
DISCOVERY TO FREEDOM! RANGE ONE MILE AND CLOSING! ESTIMATED ARRIVAL TIME, 34 MINUTES!


SPACE STATION FREEDOM
1 Radiator
2 U.S. Laboratory Module
3 Observation Cupola
4 Docking Port
5 Habitation Module
6 Solar Panels
7 Airlock
8 European Space Agency Laboratory Module
9 Japanese Laboratory Module
10 Truss
11 Resource Node
12 Canadian Mobile Servicing System
ROGER, DISCOVERY... YOU'RE LOOKING GOOD! CLEAR FOR APPROACH AND BERTHING!
NASA


BERTHING AND DOCKING SEQUENCES COMPLETED! PREPARE TO COME ABOARD!
YEARS OF STUDY ON EARTH HAVE PREPARED THE FOUR YOUNG STUDENTS FOR THEIR GREATEST ADVENTURE.
MICHELLE
I'M COMMANDER SCOTT! WELCOME ABOARD! YOU'RE OUR FIRST STUDENT SCIENTISTS IN SPACE! PLEASE INTRODUCE YOURSELVES TO YOUR FELLOW CREW MEMBERS!

I'M MICHELLE, THE EUROPEAN SCIENCE FAIR WINNER. THE ESA IS SPONSORING MY VISIT.
I'M JOHN FROM WASHINGTON, D.C., U.S.A!
JUANITA A. REBELLO, PAYLOAD SCIENTIST. I'M FROM HOUSTON, TEXAS, U.S.A.
MY NAME'S DIVINITY. I'M FROM CANADA!
ELTON S. ONO... PLEASED TO MEET YOU! I'M A SCIENTIST WITH THE JAPANESE SPACE TEAM!
STATION OPERATOR GRANT JACKSON HERE!
I AM HONORED TO BE YOUR GUEST ON THIS INTERNATIONAL SPACE STATION. MY NAME IS OSAMU.
I'M DR. MILTON SMILEY, STATION SCIENTIST. THIS IS PAYLOAD SCIENTIST SHELDON C. MCCALL
I'M IMPRESSED BY THE EXPERIMENTS THAT YOU STUDENTS DESIGNED.
LET'S TOUR THE STATION. WE'LL SEE HOW YOUR EXPERIMENTS ARE CONDUCTED.
IT'S HARD TO GET USED TO MOVING WITHOUT GRAVITY!
EACH OF OUR CREW MEMBERS HAS A SPECIAL SET OF DUTIES, SO WILL YOU... LIKE STANDING WATCH, RECORDING DATA, AND MAKING REPORTS TO THE SPACE STATION CONTROL CENTER IN HOUSTON.
HOW MANY CREW MEMBERS ARE USUALLY ON THE SPACE STATION?
THERE ARE USUALLY 8 PEOPLE ON BOARD. WHEN A SHUTTLE BRINGS A NEW SHIFT TEAM OF 4 PEOPLE, 4 OF THE ON-BOARD CREW MEMBERS RETURN TO EARTH.

THIS IS THE **LABORATORY MODULE.** HAVING A COMPLETE LAB IN SPACE ALLOWS US TO STUDY ALL TYPES OF SPACE SCIENCE. YOUR EXPERIMENTS ARE CONDUCTED HERE.

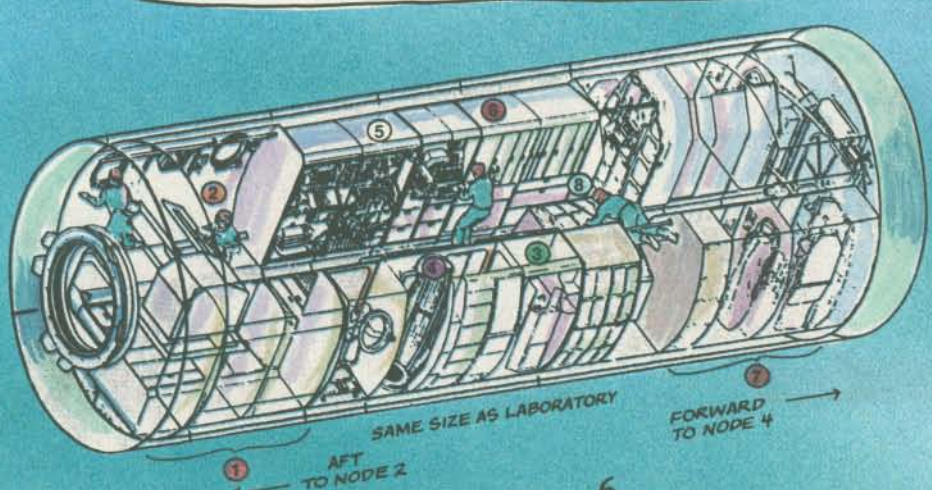


1. Materials Sciences Are
2. Glove Box
3. Maintenance Work Station
4. Element Control Workstation
5. Experiments
6. Life Sciences Area
7. Centrifuge
8. Holding Facilities
9. Lab Workbench
10. Life Sciences Glove Box
11. Supplies and Stowage

NOW WE'RE IN A **RESOURCE NODE.** THE NODES SERVE MANY FUNCTIONS. THEY ARE COMMAND AND CONTROL CENTERS. THEY ACCOMODATE COMPONENTS FOR VARIOUS SYSTEMS. THEY ALSO PROVIDE AIRLOCKS TO ENTER AND LEAVE THE SPACE STATION.

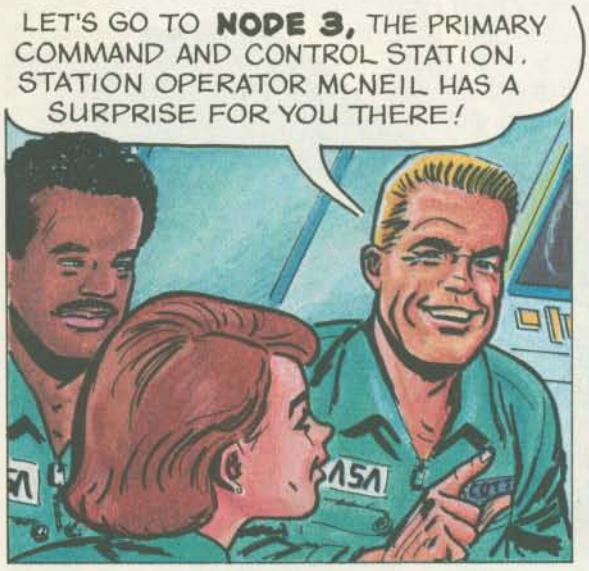
TWO NODES HAVE TWO **CUPOLAS,** FOR OUTSIDE OBSERVATION. FROM HERE YOU CAN SEE THE 8 **SOLAR COLLECTING PANELS,** WHICH PROVIDE POWER FOR THE ENTIRE STATION. THERE IS OVER A **HALF-ACRE** OF THEM, AND THEY ARE COVERED WITH 14,592 SOLAR CELLS.

THE **HABITATION MODULE** IS WHERE WE LIVE, SLEEP, EXERCISE AND EAT. WOULD YOU LIKE TO GO TO THE BATHROOM AND WASH YOUR HANDS BEFORE LUNCH?



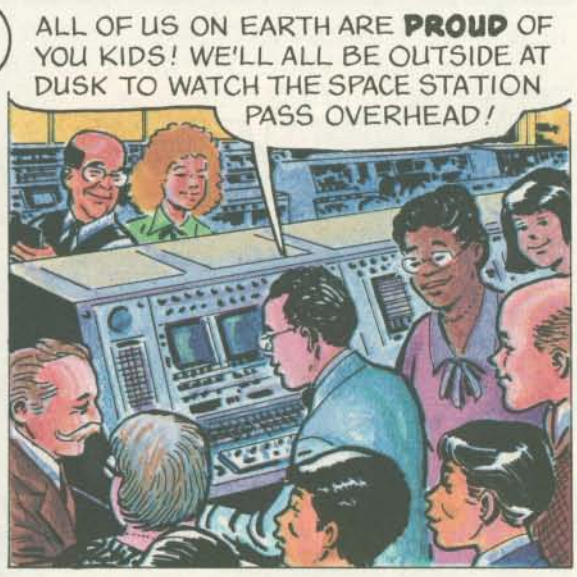
1. Wardroom
2. Galley
3. Bathroom
4. Shower
5. Health Care
6. Workstation
7. Crew Quarters
8. Stowage

THESE BURGERS ARE **GREAT!**
YOU CAN THANK OSAMU FOR THE LETTUCE AND TOMATOES! THEY WERE GROWN IN HIS **HYDROPONICS** EXPERIMENT!
EXPLORERS DURING EXTENDED SPACE TRAVEL WILL REQUIRE METHODS OF GROWING THEIR OWN FOOD. THIS IS MY AREA OF INTEREST.
NASA
NASA


LET'S GO TO **NODE 3,** THE PRIMARY COMMAND AND CONTROL STATION. STATION OPERATOR MCNEIL HAS A SURPRISE FOR YOU THERE!
NASA

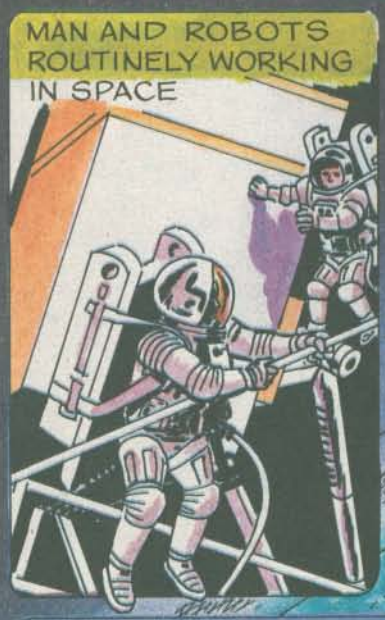
GO AHEAD, HOUSTON! YOUR YOUNG SCIENTISTS ARE HERE!
JOHN? CAN YOU HEAR ME?
MOM!

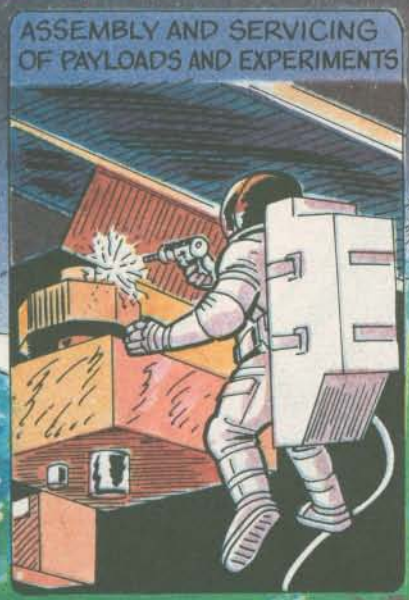
YOUR PARENTS ARE SPECIAL INTERNATIONAL GUESTS OF **NASA** AT THE SPACE STATION CONTROL CENTER IN **HOUSTON.**


ALL OF US ON EARTH ARE **PROUD** OF YOU KIDS! WE'LL ALL BE OUTSIDE AT DUSK TO WATCH THE SPACE STATION PASS OVERHEAD!

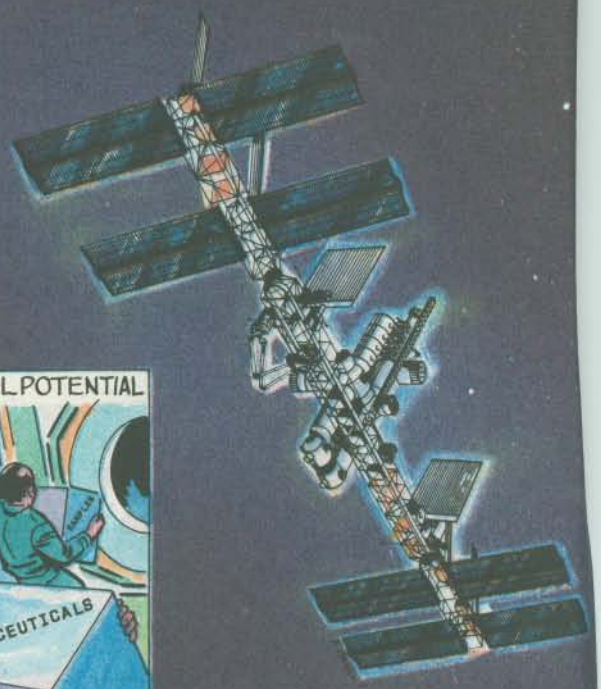
ON EARTH... AT THE JOHNSON SPACE CENTER...
EARTH SEEMS SO **FAR** AWAY!
AN INTERNATIONAL CREW ON **EARTH** RECEIVES SPACE STATION FREEDOM DATA AND MONITORS OUR ACTIVITIES.
TENS OF **THOUSANDS** OF PEOPLE ON EARTH HELPED TO BUILD IT. I WORKED WITH THE GROUND CREW ON THE **FIRST** ASSEMBLY FLIGHT!
HOW MANY FLIGHTS DID IT TAKE TO ASSEMBLE SPACE STATION FREEDOM?
IT TOOK 20 SPACE SHUTTLE FLIGHTS TO ASSEMBLE THE STATION AS IT IS TODAY. WE CONTINUE TO ADD NEW COMPONENTS TO TAKE ADVANTAGE OF THE EVOLVING TECHNOLOGIES AND NEW EXPERIMENTS.
ESA

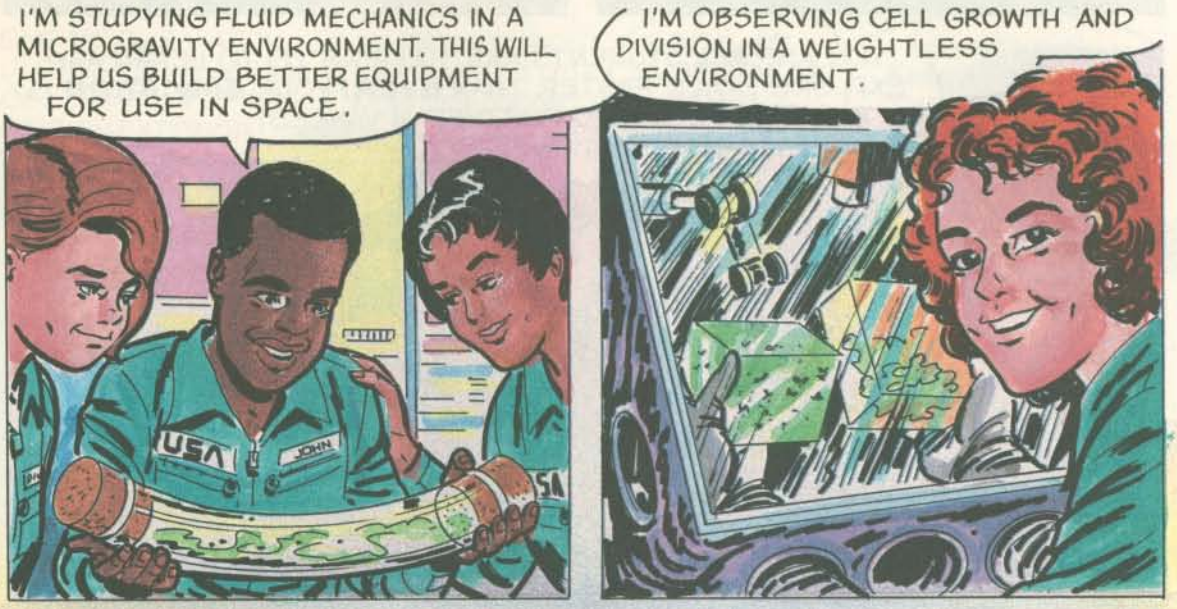
FUNCTIONS OF SPACE STATION FREEDOM





BENEFITS OF SPACE STATION FREEDOM





SPACE STATION FREEDOM IS HELPING US LEARN MORE ABOUT OUR PLANET, OUR UNIVERSE, AND HOW WE CAN LIVE AND WORK BETTER... BOTH ON EARTH AND IN SPACE!

LIFE SCIENCES

- Space Biology
- Space Medicine
- Global Biology
- Life Support Systems

MATERIAL SCIENCES

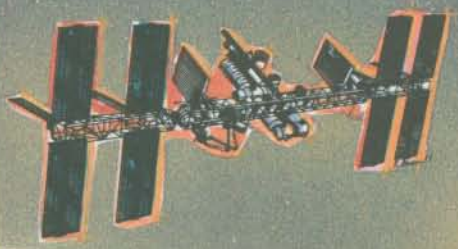
- Microgravity Research
- Pharmaceuticals

EARTH SCIENCE AND APPLICATIONS

- Global Observations
- Climatology
- Upper Atmospheric Research

ASTRONOMICAL AND PLANETARY SCIENCES

- Astrophysics
- Plasma Physics
- Solar Physics
- Astrometric Observations
- Planetary Observations

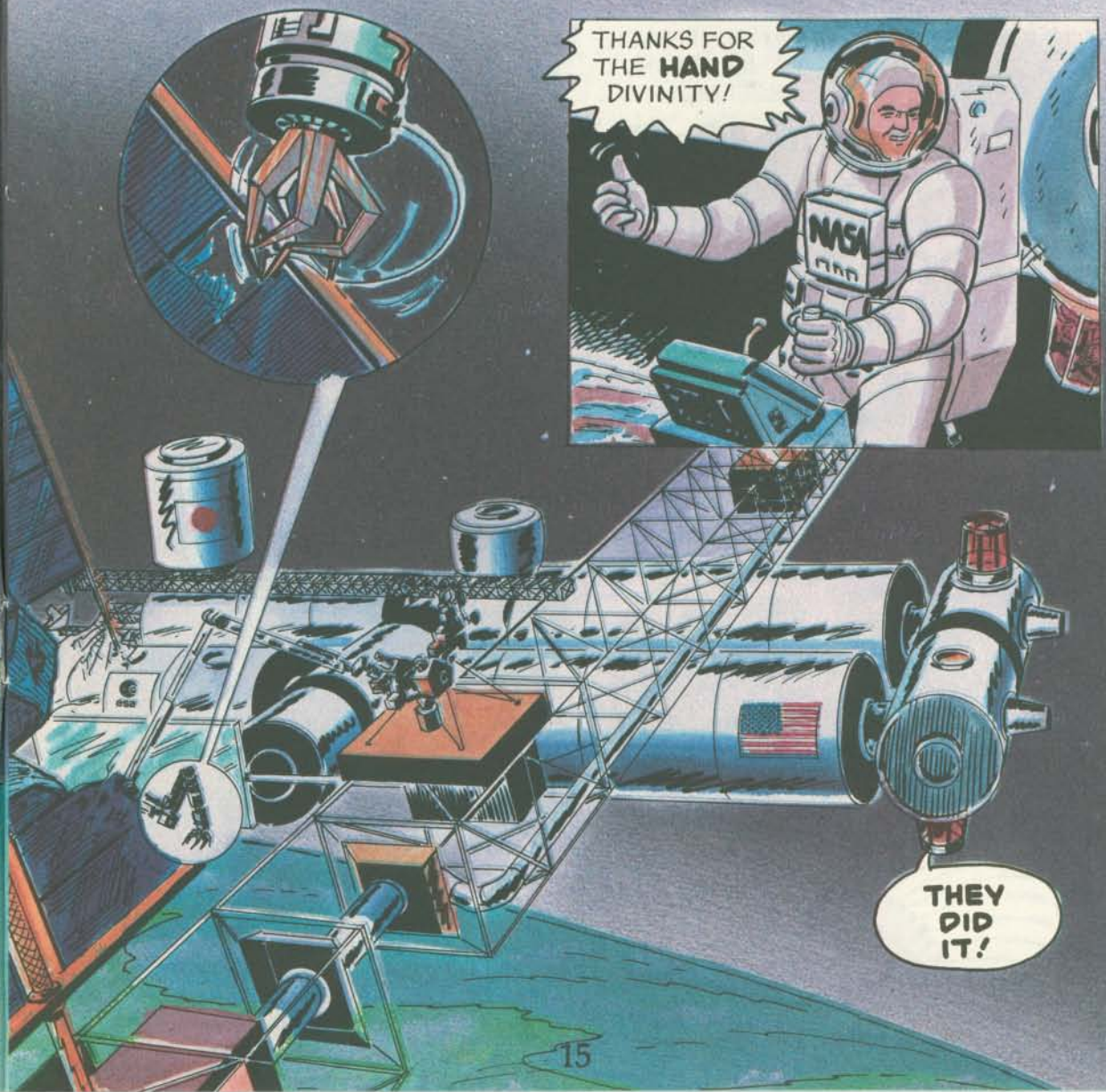


FUTURE SPACE TRAVELERS WILL NEED WAYS TO **FEED** THEMSELVES! I'M TESTING THE PRODUCTIVITY OF DIFFERENT PLANTS IN A SPACE ENVIRONMENT!
THIS **ROBOT** HAND I DEVELOPED WILL PERFORM DELICATE REPAIR OPERATIONS **OUTSIDE** THE SPACE STATION!
YOU AND **ALL** STUDENTS ARE HELPING US TO LEARN AND EXPLORE SPACE FASTER THAN **EVER!** YOUR **EDUCATION** IS THE **FIRST** STEP TO FURTHER ADVANCES IN SPACE EXPLORATION!
NASA
USA
SCIENCE AND MATH ARE **IMPORTANT!** STUDYING THEM NOW WILL HELP US REACH THE PLANETS AND THE STARS!
UP HERE IN SPACE STATION FREEDOM, THE STARS **ALREADY** SEEM CLOSER!

WE SLEEP IN **SHIFTS** ON THE SPACE STATION. JOHN AND DIVINITY WILL STAND FIRST WATCH. MICHELLE AND OSAMU WILL SLEEP IN THESE QUARTERS!
IT'S LIKE SLEEPING STANDING UP IN A **CLOSET!**
THERE IS NO **UP** OR **DOWN** IN SPACE! GOOD-NIGHT!
ONE OF OUR WATCH DUTIES IS THE VISUAL OBSERVATION OF THE STATION EXTERIOR!
I LEARNED ABOUT KEEPING WATCH AS AN ASTROSCOUT!
LOOK AT THAT SOLAR PANEL!
SOMETHING **SMASHED** RIGHT THROUGH IT!
IT MUST HAVE BEEN A PIECE OF **SPACE DEBRIS!**

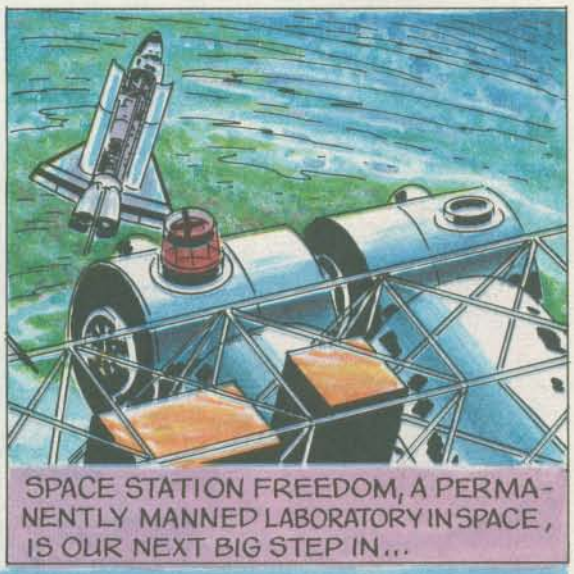
GOOD WORK KIDS! SPACE "JUNK" IS A REAL PROBLEM UP HERE! THERE ARE TENS OF THOUSANDS OF PIECES OF MAN-MADE DEBRIS IN ORBIT, PLUS METEOROIDS.
A B B SIZE PELLET AT ORBITAL SPEED HAS ABOUT THE SAME ENERGY* AS A BOWLING BALL GOING 60 M.P.H.!
*KINETIC ENERGY= 1/2 MASS X VELOCITY²
WE'VE LOST ALL POWER FROM THAT PANEL! THIS COULD EFFECT OUR EXPERIMENTS!
DR. SMILEY, CAN WE FIX THE BASE OF THAT SOLAR PANEL WITH THE MSS*?
THE MSS COULD DO IT... BUT WE'LL NEED A MORE SENSITIVE ROBOTIC HAND FOR THE SOLAR CELLS.
* MOBILE SERVICING SYSTEM
DO YOU THINK YOUR ROBOT HAND IS READY FOR A FIELD TEST?
WE CAN ATTACH IT TO THE MSS AND GIVE IT A TRY!
AT THE MSS CONTROLS, MCNEIL MANEUVERS THE ARM ASSEMBLY TOWARDS THE DAMAGED PANEL.

THE ROBOTIC HAND ATTACHED TO THE MSS PERFORMS FLAWLESSLY.



OUR WEEK ON SPACE STATION FREEDOM PASSED TOO QUICKLY!
I'LL ALWAYS REMEMBER HOW EARTH LOOKS FROM SPACE!
USA
DIVINITY
MICHELLE

DISCOVERY, YOU'RE CLEARED TO DISENGAGE!
AH, ROGER, FREEDOM, SEE YOU GUYS BACK IN HOUSTON NEXT MONTH!


SPACE STATION FREEDOM, A PERMANENTLY MANNED LABORATORY IN SPACE, IS OUR NEXT BIG STEP IN...

...LEARNING ABOUT OUR WORLD AND ITS PLACE IN THE UNIVERSE.
SPACE STATION FREEDOM-- IT'S IN YOUR FUTURE!

Dear Educators and Parents,

This educational comic book on the Space Station Freedom Program is the first of its kind. It just scratches the surface of a new program that will be going on for many decades; one that your child could be a part of, if he or she prepares for it over the next several years.

This issue introduces four international science fair winners who are sponsored by one of the Space Station Freedom Program's international partners; USA, Canada, Europe, and Japan. These four students have been preparing for their Adventures on Space Station Freedom for many years and are now about 18 or 19 years old. They are ready for college. They are guests aboard Freedom to work with the international astronauts on their experiments. The time is just after the turn of the century.

Your children and students can use this book to learn and study about space. This first issue introduces many topics for discussion in class or for home research. Depending on the level of the child, some equations and laws can also be explained. Throughout the book are subtle references to such things as: force, mass, velocity, acceleration, atmospheric layers, pressure, volume, robotics, hydroponics, engineering, medicine, kinetic energy, solar energy, gravity, and much more. These subjects are stated in simple terms. The following are just a few suggested areas for classroom discussion and activities:

Space Shuttle vs. Space Station

Have the students look at both the Shuttle and the Space Station pictures or models. Develop the concepts of the Shuttle as a transportation vehicle (truck) versus the Space Station as a factory, laboratory or school. Trucks bring the building blocks of the laboratory to a selected location for construction. Similarly the Space Shuttle brings the parts of the Space Station (laboratory) to low Earth orbit, about 250 miles high (the building site or location). Since the size of the Shuttle payload bay (trailer) is limited, it takes about 20 Shuttle flights (truck loads) to get all of the pieces (called elements and systems) to low Earth orbit. The concepts of mass and volume can be added depending on age and maturity.

Orbital Mechanics

The orbital altitude of the Space Station and Shuttle is about 250 miles or the distance from Washington D.C. to New York or Houston to Dallas. You could relate this distance from your school to a major nearby city. The children could then relate this distance to the radius and diameter of the Earth and see that the ratio of orbital attitude to various Earth distances is quite small. You could even relate this orbital altitude to the thickness of the skin on an apple! Similarly, they can relate the the Space Station's orbital period (about 90 minutes) to the Earth's rotational period (24 hrs). You could also relate orbital speed (about 17,500 mph) to various objects such as a bullet or jet and make other comparisons that are familar to the kids. You can show the children the orbit's inclination to the Earth (28.5°) and relate that to the latitude of Cape Kennedy, Florida. This can lead to more complex discussions of Geography, the Earth's inclination and other orbital parameters, as well as why different orbits are good for different scientific observations.

Astronaut Specialties

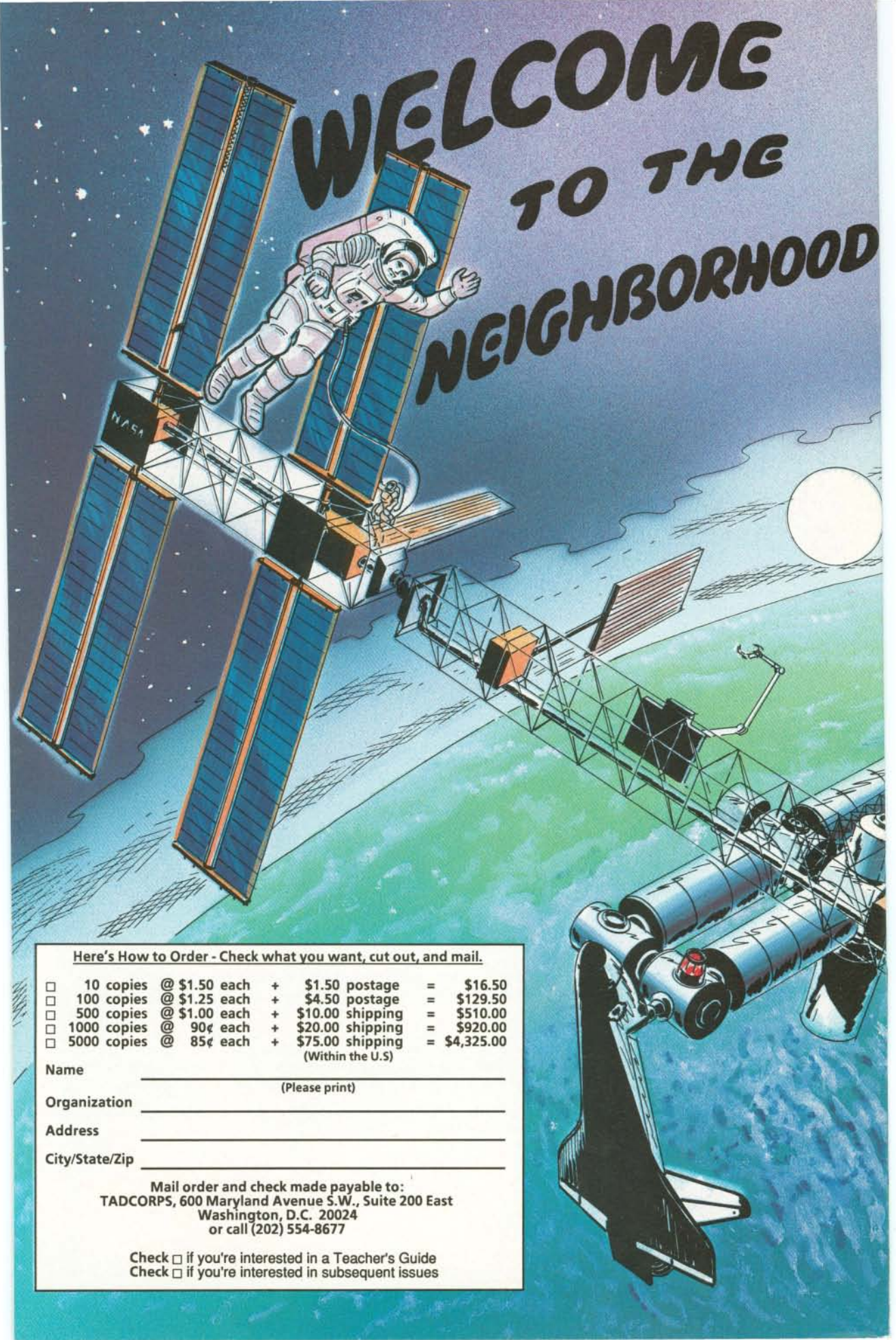
The children will be introduced to different kinds of astronauts. Their different positions, roles and responsibilities could be related to different crew members on an airplane, different jobs in a laboratory or factory, and therefore to different training and education. The different kinds of astronaut duties could be discussed and, depending on the age group, class or homework assignments could be given. For example, what special equipment must the astronauts have to work outside The Space Station rather than inside? Why are space walks hard and dangerous work?

As you can see from just these few examples, an entire Teacher's Guide could be written for each comic book or for space flight in general. We are considering a number of ways to relate complex space operations and systems to familiar "Earthy" situations that are more understandable.

I solicit your ideas as well as the children's on how to make this series of comic books educational as well as entertaining. My address is on the order form.

"Spaceally" yours - Uncle Dutch

Uncle Dutch



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